



west virginia department of environmental protection

Division of Mining and Reclamation
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Charleston, WV 25304

Joe Manchin, III, Governor
Randy C. Huffman, Cabinet Secretary
www.wvdep.org

MEMORANDUM

To: All DMR Employees
From: Lewis A. Halstead, Deputy Director
Date: September 2, 2008
Re: Ground Cover and Productivity Success Standards

This document replaces the ‘Productivity and Ground Cover Success Standards’ memorandum issued on May 1, 2002 and modified on March 26, 2007.

Ground Cover

Ground cover success will be evaluated using the Rennie and Farmer technique described in section 3 of “Technical Guides of Reference Areas and Technical Standards for Evaluating Surface Mine Vegetation in OSM Regions I and II” by Robert E. Farmer, Jr. et al, OSM J5701442/TV-54055A, 1981, U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement. et al, OSM J5701442/TV-54055A, 1981, U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSM Technical Guides). To document ground cover, a tally sheet shall be filed with the Phase II indicating pass/fail of the ground cover.

Other methods may be used if approved by the Secretary. The permittee and the Secretary shall agree on the method for evaluating ground cover and it shall be clearly presented in the Reclamation/Revegetation Plan.

In accordance with 38CSR2-9, the operator is to request a final inspection and final bond release that includes a final vegetative evaluation using approved, statistically valid sampling techniques. Upon receipt of the request, the agency will conduct an inspection to verify the final vegetative evaluation.

Productivity Success Standards

A. Pasture and Hayland.

The productivity standard for hayland and/or pastureland may be based:

Promoting a healthy environment.

1. On the statewide 12-year average county yields; 1.6 tons dry matter per acre or an animal-unit-month of 3.;
2. Productivity tables found in NRCS soil surveys for the county;
3. Average county yields recognized by the United States Department of Agriculture (USDA), West Virginia Department of Agriculture (WVDA) or West Virginia Extension Service (WVES);
4. Standard developed in cooperation with the permittee, DEP and the USDA, WVDA or WVES for the proposed area; or
5. Alternative standards may be used if approved by the Secretary. The permittee and the Secretary shall agree on the alternative standard and it shall be clearly presented in the Reclamation/Revegetation Plan.

The procedures for evaluating productivity for hayland and/or pastureland may include:

1. Actual yield records or actual animal production;
2. Clip and weigh (See Section 1 of OSM Technical Guides)
3. Pasture Plate (See WVDEP Pasture Plate Method.); or
4. Other methods may be used if approved by the Secretary. The permittee and the Secretary shall agree on the method for evaluating productivity and it shall be clearly presented in the Reclamation/Revegetation Plan

B. Crop Land

The productivity standard for cropland may be based:

1. On the statewide 12-year average county yields;
2. Yields for reference crops from unmined lands. Reference crop yields shall be determined from the current yield records of representative local farms in the surrounding area;
3. Productivity tables found in NRCS soil surveys for the county;
4. Average county yields recognized by the USDA, WVDA or WVES;
5. Standard developed in cooperation with the permittee, DEP and the USDA, WVDA or WVES for the proposed area;
6. Alternative standards may be used if approved by the Secretary. The permittee and the Secretary shall agree on the alternative standard and it shall be clearly presented in the Reclamation/Revegetation Plan.

The procedures for evaluating productivity for cropland may include:

1. Actual yield or production records;
2. Alternative standards may be used if approved by the Secretary. The permittee and the Secretary shall agree on the alternative standard and it shall be clearly presented in the Reclamation/Revegetation Plan

WVDEP Pasture Plate Method

The method requires a yardstick, a standardized 18-inch square Plexiglas pasture plate (Rayburn and Rayburn 1998), a 12-inch square wire quadrant, a clipper, and sample bags. The pasture plate is suspended from the hand by a suitable cord, and lowered gently onto the sward at the selected sample point. The yardstick is inserted through a 1.5-inch hole to make contact with the ground, and the distance from the ground to the pasture plate is measured to the nearest half inch. If required, an associated clip is taken by placing the quadrant on the ground after the plate is lifted, and then cutting at ground level all vegetation that is rooted within the quadrant. Clips are dried and weighed.

The WVDEP Pasture Plate Method is calibrated for forage mixes after June 15. Forms for field data collection are attached. Data collection begins with collection of a sufficient number of randomly distributed height measurements. A sufficient number is at least 60 and not more than 200. From these observations a mean plate height is obtained. To estimate the forage mass, this mean (HT) is entered into the following generalized calibration equation:

$$\text{Forage Mass in tons} = 502 \text{ HT} - 9.25 \text{ HT}^2 / 2000$$

Sites with HT of 8.5 inches will have a forage mass of at least 1.6 tons /acre whereas sites with HT of 6.0 inches will have a forage mass of approximately 1.2 tons /acre. Therefore, height alone can be used to screen and eliminate sites. However, if height (HT) is in the range of 6.0 to 8.5 inches, site-specific local calibration (Method L) is to be used.

Method L

To accomplish the local calibration, Method L, an Excel spreadsheet named "Local Plate Meter Calibration" is used. First, use the sample of 60 to 200 height observations HT across the entire site or representative sub-areas. Construct a distribution of HT and estimate the mean, while still in the field. Next, still in the field, take a series of 16 paired heights (using the standard plate meter) and clipped forage samples (clipped to ground level from a 1 square foot quadrant). These clips should be evenly balanced with half below and half above the mean height. Avoid taking clips from areas with heights that are "outliers" (outside the percentile range from 3 to 97, or more than 2 standard deviations from the mean).

Height values are entered into the spreadsheet on the worksheet page entitled "Site Forage Height". Clip samples are dried, and dry weights and associated heights are entered on the worksheet page entitled "Height vs. Clipped Forage Mass." In the spreadsheet, sample weights are entered in grams. The spreadsheet calculates forage density for each clipped sample (grams/inch plate height/sqft), calculates the covariance of plate height and clipped forage density, and converts grams to pounds. On the page entitled "Site Summary" the spreadsheet reports the mean forage mass on the site based on the mean site plate height and the mean density of the clipped samples. It calculates the confidence interval of this product from the

variance of site plate height, variance of the clipped forage density and covariance between clipped sample plate height and forage density (Freese, 1962).

If the calculated mean site forage mass is equal to or greater than the goal forage mass, the site passes. If the Upper CI on Site Forage Mass (mean site forage mass plus the CI) is greater than the goal forage mass the site passes based on the t-test since this comparison using the CI is simply a rearrangement of the t-test equation of a mean and its variance against a constant.

References

Freese, F. 1962. Elementary Forest Sampling. Washington, DC, US Department of Agriculture - Forest Service.

Rayburn, E. B. and S. B. Rayburn (1998). "A standardized plate meter for estimating pasture mass in on-farm research trials." Agron. J.(90): 238-241.

Rayburn, E.B. 1997. An acrylic plastic weight plate for estimating forage yield. WVU-ES TRIM Fact Sheet 5022. <http://www.caf.wvu.edu/~forage/pastplate.htm>

Rayburn, E. B., and J. Lozier. 2003-2004. Reports prepared for West Virginia Department of Environmental Protection on the estimation of forage mass from sward height on West Virginia surface mine sites.